NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM

EOS

EARTH OBSERVING SYSTEM

FUI Detailed Design

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17 October 1995

FOS CDR Roadmap

FOS CDR Overview
- FOS CDR goals
- Driving requirements

Engineering Activities
- Activities since PDR
- FOS team approach

System Architecture
- Overview
- Features

IST
- Capabilities
- Plans

Hardware Design
- Computers
- Peripherals

Network Design
- EOC LAN
- IST Connectivity

FOS Infrastructure
- Mgt Services
- Comm Services

Segment Scenarios
- End-to-End Flow
- Subsystem Interfaces
- Building block linkage

RMA
- RMA allocation
- FMEA/CIL

Operations Overview
- EOC facilities
- FOT positions

Operational Scenarios
- End-to-end flow
- Operations perspective
- FOT tool usage

Development
- Release Plan
- Development approach

Testing
- Test approach
- Test organization

JC-2

FUI Detailed Design

Overview

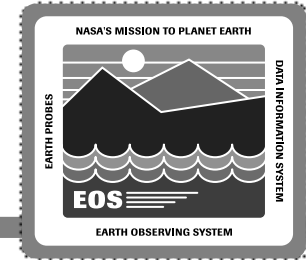Design Features

Analyses

COTS Philosophy
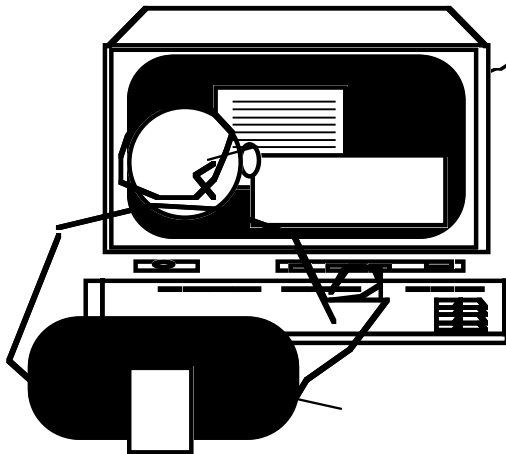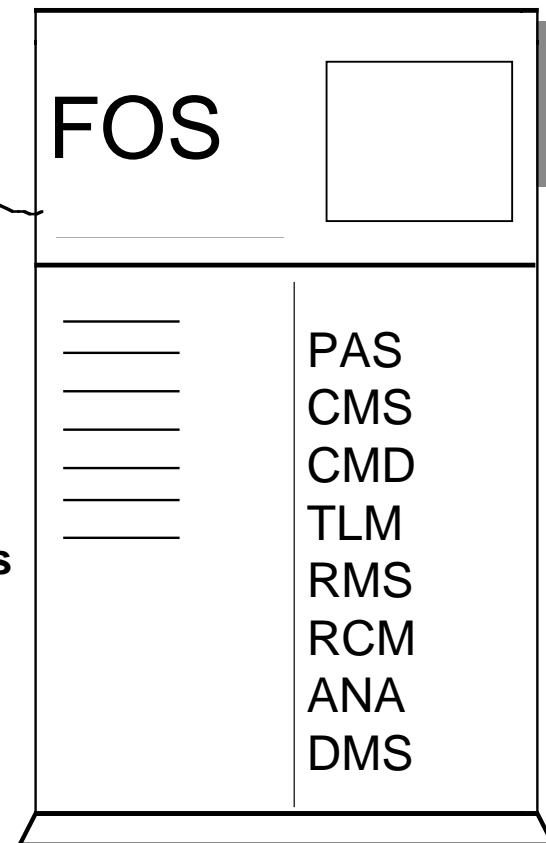
COTS

H/W Mapping

Components

Presentations

FUI Overview

FOS User Interface (FUI) Subsystem provides user interface services for all FOS Subsystems

FOS

- **Accept/route user requests**
- **View telemetry, events, analysis results**
- **Generate analysis requests, reports, standing orders**
- **Command language**
- **Command execution control**
- **Builders/Editors for procs & loads**
- **Access to docs, on-line help, EMail**

PAS
CMS
CMD
TLM
RMS
RCM
ANA
DMS

FUI Design Features
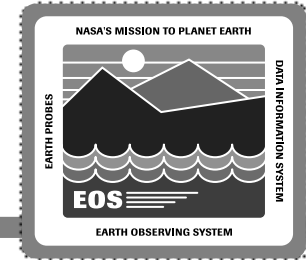
Clear Mental Models

- **Ease of use, intuitive traversal techniques**
- **Consistency & clarity**
  - **Same displays at EOC and ISTs**
 - **Same displays Off-line and Real-time**

Platform / COTS Independence

- **No fundamental COTS dependencies**
- **Don't lock ourselves into any one vendor or product**

Extensible/Flexible

- **Able to grow and change as technology advances**
- **Allow for user customization where appropriate**
  - **Windows, rooms, colors (non-realtime windows), color intensities (realtime windows), fonts**

FUI Design Features
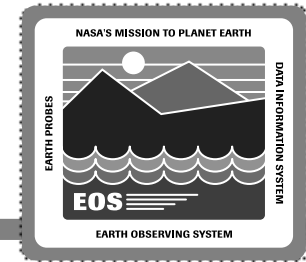
Robust data displays

- **Different views of the data (alpha, graph, 3/d graph, table, schematics)**
- **Quick Analysis to get to different views of the same data**
- **Multiple data sources on the same page**
- **Dataset overlays**
- **Extensive display builder capabilities**

Comprehensive Commanding Interface

- **Automated ground script processing**
- **All operators (EOC and IST) have view into executing ground script**
- **Electronic contact plan change (command requests)**
- **Syntax check / validation on procedures**

FUI Design Features
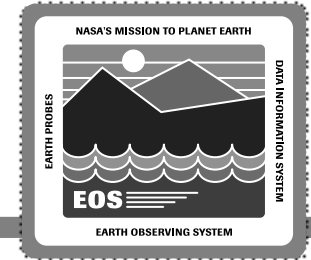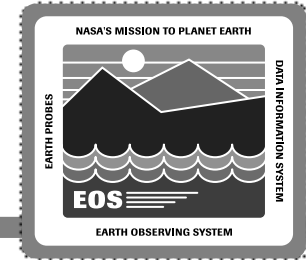
Automated Report Generation

- **Standing Orders**
- **Considerable report builder/report generation capabilities**

Powerful, "Action Centered" Tools

- **Time selector**
- **Selection filter**
- **Context sensitive help**
- **Hypertext document reader**

High reuse for follow-on missions

FUI Analyses

Survey of user interface practices at: GSFC, NOAA, Intelsat, other commercial (1993-95)
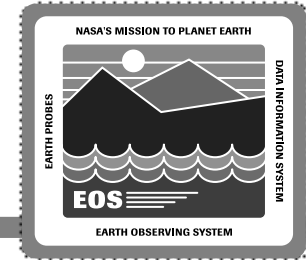
Task Analysis (1993)

Prototype

- **IST Prototype**

    - **Drive out L4 requirements**

    - **Vehicle to solicit customer feedback**

    - **Risk reduction**

Command Language Study (10/94)

- **CSTOL   Colorado STOL (OASIS)**
- **PSTOL   (PORTS)**
- **TSTOL   (TPOCC)**
- **PACS STOL   (NOAA)**
- **SCL   (Clementine)**
- **UIL Spec for Space Station**

OASIS Procedure Conversion

FUI Analyses

Usability Testing

- **Tested prototype in 9/94**
- **Emperical assessment of usability provided human factors feedback**
- **Lessons learned folded into FUI Style Guide & Screen Design**

FUI Style Guide - Spring 95

Screen Design Reviews

- **As part of detailed design process**
- **Distributed screens at instrument workshop (8/95) to solicit user feedback**
- **Separate screen design reviews with NASA and FOT**

COTS Evaluations

- **GUI Builder (1994)**
- **Graphics Packages (1994)**
- **Graph pkgs (5/95)**
- **Table pkgs (6/95)**

FUI COTS Philosophy
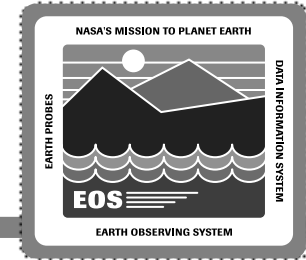
Need platform independence

- **ISTs can run on multiple UNIX platforms**

Don't want to be too dependent on any one product

- **If BX, XRT, or even X/Motif go out of business or become obsolete we can swap in another product**
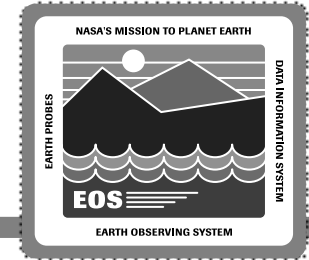
Flexibility

- **We are able to switch views of data, and combine different views of data on the same screen**

- **Can tie multiple data sources into one screen, even into one graph on one screen**

We have designed the FUI for growth - high reuse for follow-on missions

- **100% reuse for telemetry pages, ground script processing, others**

FUI COTS Philosophy

Same Interface realtime and offline

- **There are analysis tools that do both number crunching and displays (IDL, PV-Wave, RTworks, Altair, etc.)**
- **But, by decoupling the crunching and display:**
  - **a switch of products by Analysis (from IDL to IMSL) doesn't affect FUI**
  - **can have the same interface for off-line and real-time**

All functions are available from all user stations

FUI COTS
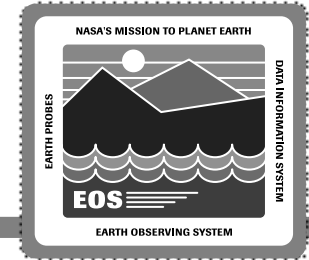
X/MOTIF: Graphics & windowing building blocks
- **COTS industry standard**
- **cross platform support**

BX: GUI Builder
- **increase development productivity**
- **tool evaluation showed: produced "cleanest" C++ code (readability, Motif w/classes), easiest to use, best price**
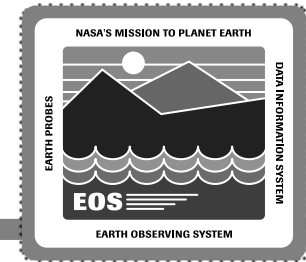- **able to configure the tool to produce ECS standard code**

XRTGraph/XRTTable/XRT3d: Graph and table widgets
- **works in an X drawing area**
- **best performance of tools evaluated**
- **no runtime fee**

HTML Browser (MOSAIC or NETSCAPE)

Publishers Display Format (PDF) Editor

FUI Hardware Map

Real-Time Server

Commanding
    ground script cntrl

COTS

Data Server

Commanding
    cmd request hndlr

Analysis
    standing order mgr
    analysis rqst hndlr

COTS

User Station

User Login
Analysis Windows
Analysis rqst hndlr
Dynamic Page
Commanding
Event Displays
Replay Controller
CMS Table
    displays & editors
Report Generation
Room Definition
User Customization
Control Window
Quick Message
Data Mover
Procedure Builder
Display Builder
Help, Doc Reader
EMail

COTS
    HTML Browser
    X/Motif
    XRT
    PDF Editor

IST

User Login
Analysis Windows
Analysis rqst hndlr
Dynamic Page
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COTS
    HTML Browser
    X/Motif
    XRT
    PDF Editor

* does not include command control or command request evaluation

FUI Components
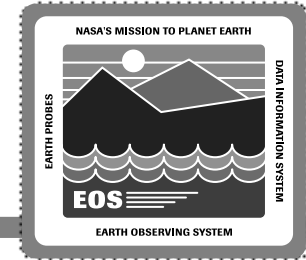
General

- **User Customization**
- **Control Windows****
- **Login Screens**

Commanding

- **Command Language ***
- **Procedure Control ***
- **Command Control ***
- **Command Monitor ***
- **Command Requests ***

Planning and Scheduling Screens**

KEY:
* - FUI Presentation
** - Other CDR Presentation

FUI Components (cont.)
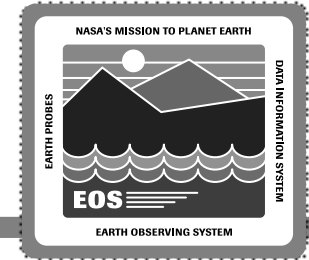
Telemetry Displays

- **Alphanumerics ***
- **Graphs ***
- **Tables ***
- **Schematics ***
- **Info Window**
- **Status Window**
- **SSR Analysis Window****

Reports *

Utilities

- **Data Source Selector ***
- **Time Selector**
- **Selection Filter**

KEY:
* - FUI Presentation
** - Other CDR Presentation

FUI Components (cont.)

Analysis

- **Request ***
- **Request Handler ***
- **Product Format ***
- **Standing Order Manger & Browser ***
- **Algorithm Registration ***
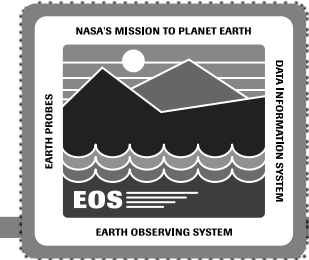- **Status**
- **Quick Analysis**

Command Management Displays

- **Load Manager ****
- **Table Load Builder**
- **RTS Load Builder ****
- **ATC Buffer Display**
- **RTS Buffer Display**
- **Ground Script Display**

KEY:
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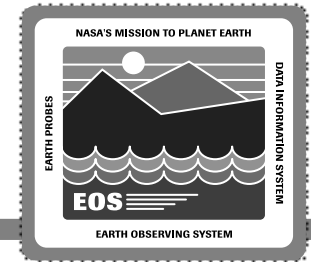
FUI Components (cont.)

Tools

- Event Display *
- Event History Request *
- Display Builder *
- Procedure Builder**
- Command Builder**
- Room Builder
- Replay Controller
- Data Mover
- Document Reader
- Quick Message Generator
- Help
- EMail

KEY:
* - FUI Presentation
** - Other CDR Presentation

FUI Presentations

Rick Broome

- **Command Language, Commanding Support**

Shawn Firth

- **Dynamic Pages, Display Builder, Reports**

Marlene Quick-Campbell

- **Analysis Requests, Standing Orders, Algorithm Registration**

Ginny Schmidt

- **Events**